

CLAIMS

That which is claimed is:

1. A chimeric polypeptide comprising:
 a virus coat polypeptide sequence and a viral receptor polypeptide sequence, wherein the coat polypeptide sequence and the receptor polypeptide sequence are linked by an amino acid spacer of sufficient length to allow the coat polypeptide sequence and the viral receptor polypeptide sequence to bind to each other.

2. The chimeric polypeptide according to claim 1, wherein the chimeric polypeptide has an amino acid sequence selected from the group consisting of SEQ ID NO: 13, SEQ ID NO: 2, SEQ ID NO: 4 and SEQ ID NO: 6.

3. The chimeric polypeptide according to claim 1, wherein the virus coat polypeptide sequence is selected from the group consisting of SEQ ID NO: 24, SEQ ID NO: 30 and SEQ ID NO: 28.

4. The chimeric polypeptide according to claim 3, where the receptor polypeptide sequence is selected from the group consisting of SEQ ID NO: 26 and SEQ ID NO: 20.

5. The chimeric polypeptide of claim 1, wherein the virus is an immunodeficiency virus selected from the group consisting of HIV, SIV, FIV, FeLV, FPV, and herpes virus.

6. The chimeric polypeptide of claim 1, wherein the virus coat polypeptide comprises a gp120 polypeptide sequence.

7. The chimeric polypeptide of claim 6, wherein the gp120 polypeptide sequence lacks 60 amino acids from the amino terminus and 20 amino acids from the carboxyl terminus.

8. The chimeric polypeptide of claim 1, wherein the receptor is a CD4 polypeptide sequence.

5 9. The chimeric polypeptide of claim 18, wherein the CD4 polypeptide sequence comprises the D1 and D2 domains.

10. The chimeric polypeptide of claim 1, wherein the spacer has from about 5 to about 200 amino acids.

10 11. The chimeric polypeptide of claim 1, wherein the spacer comprises a peptidomimetic sequence.

12. The chimeric polypeptide of claim 1, further comprising a heterologous domain.

15 13. The chimeric polypeptide of claim 12, wherein the heterologous domain is selected from the group consisting of: a tag, an adhesin, and an immunopotentiating agent.

20 14. The chimeric polypeptide of claim 12, wherein the heterologous domain is selected from the group consisting of SEQ ID NO: 11 and SEQ ID NO: 32.

15. The chimeric polypeptide of claim 2, further comprising a pharmaceutically acceptable carrier.

25 16. The chimeric polypeptide of claim 4, further comprising a pharmaceutically acceptable carrier.

30 17. A polynucleotide sequence comprising a nucleic acid sequence encoding the chimeric polypeptide of claim 1.

18. The polynucleotide sequence according to claim 17, wherein the nucleic acid sequence is selected from the group consisting of SEQ ID NO: 1, SEQ ID NO: 3, SEQ ID NO: 5 and SEQ ID NO: 12.

5 19. The polynucleotide sequence according to claim 17, wherein a nucleic acid sequence for the virus coat polypeptide is selected from the group consisting of SEQ ID NO: 23, SEQ ID NO: 29 and SEQ ID NO: 27.

10 20. The polynucleotide sequence according to claim 19, wherein a nucleic acid sequence for the receptor polypeptide is selected from the group consisting of SEQ ID NO: 25 and SEQ ID NO: 19.

21. A host cell containing the expression vector of claim 18.

15 22. A host cell containing the expression vector of claim 20.

23. An antibody or functional fragment thereof that binds to the chimeric polypeptide of claim 1.

20 24. An antibody or functional fragment thereof that binds to the chimeric polypeptide of claim 2.

25 25. An antibody or function fragment thereof that binds to the chimeric polypeptide of claim 4.

26. The antibody of claim 23, wherein the antibody neutralizes the virus in vitro.

27. The antibody of claim 24, wherein the antibody neutralizes the virus in vitro.

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28. The antibody of claim 25, wherein the antibody neutralizes the virus in vitro.

29. The antibody of claim 24, wherein the antibody inhibits virus infection.

5 30. The antibody of claim 25, wherein the antibody inhibits virus infection.

31. The antibody of claim 24, wherein the antibody binds to an epitope produced by the binding of the virus coat polypeptide sequence and the receptor polypeptide sequence.

10 32. The antibody of claim 25, wherein the antibody binds to an epitope produced by the binding of the virus coat polypeptide sequence and the receptor polypeptide sequence.

33. The antibody of claim 31, wherein the epitope is present on an envelope polypeptide sequence.

15 34. A method for producing an antibody that binds to the chimeric polypeptide of claim 1, comprising administering the chimeric polypeptide of claim 1 to a subject, or a polynucleotide that encodes the chimeric polypeptide of claim 1, in an amount sufficient for the subject to produce antibody to the chimeric polypeptide of claim 1.

20 35. A method for producing an antibody that binds to the chimeric polypeptide of claim 2, comprising administering the chimeric polypeptide of claim 2 to a subject, or a polynucleotide that encodes the chimeric polypeptide of claim 2, in an amount sufficient for the subject to produce antibody to the chimeric polypeptide of claim 2.

25 36. A method for inhibiting virus infection in a subject comprising administering to the subject an effective amount of the chimeric polypeptide of claim 4, or a polynucleotide encoding the chimeric polypeptide of claim 4, to inhibit virus infection of a cell expressing a virus co-receptor polypeptide, thereby inhibiting virus infection.

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37. The method of claim 35, wherein the virus is an immunodeficiency virus.

38. The method of claim 35, wherein the subject is a human.

5 39. A method for producing an immune response to a virus in a subject comprising administering to the subject an effective amount of the chimeric polypeptide of claim 2, or a polynucleotide that encodes the chimeric polypeptide of claim 2, to produce an immune response to the virus.

10 40. The method of claim 39, wherein the virus is an immunodeficiency virus.

41. The method of claim 39, wherein the subject is a human.

42. The method of claim 39, wherein the immune response comprises an antibody.

15 43. The method of claim 42, wherein the antibody binds to an epitope produced by the binding of the virus coat polypeptide sequence and the receptor polypeptide sequence.

44. The method of claim 42, wherein the antibody neutralizes the virus *in vitro*.

20 45. A method for identifying an agent that inhibits an interaction between a virus and a virus co-receptor comprising the steps of: (a) contacting the chimeric polypeptide of claim 2 with a virus co-receptor under conditions allowing the chimeric polypeptide and the co-receptor to bind, in the presence and absence of a test agent; and (b) detecting
25 binding in the presence and absence of the test agent, wherein decreased binding in the presence of the test agent thereby identifies an agent that inhibits binding between the virus and the virus co-receptor.

30 46. The method of claim 45, wherein the virus is an immunodeficiency virus.

47. The method of claim 45, wherein the immunodeficiency virus co-receptor is a CCR5 or CXCR4 polypeptide sequence.

48. The method of claim 45, wherein the virus co-receptor is present on the surface of an intact cell.

49. A method for identifying an agent that inhibits an interaction between a virus and a virus receptor comprising the steps of: (a) contacting the chimeric polypeptide of claim 2 with a test agent; and (b) detecting binding between the virus coat polypeptide sequence and the viral receptor polypeptide sequence, wherein a decreased amount of binding in the presence of the test agent identifies an agent that inhibits binding between the virus and the virus receptor.

50. The method of claim 49, wherein the test agent is selected from the group consisting of a peptide, an organic molecule, an antibody, an antiviral, an immunodeficiency virus receptor or functional fragment thereof.

51. The method of claim 50, wherein the immunodeficiency virus receptor polypeptide is a CD4 polypeptide sequence.

52. A method for identifying a chimeric polypeptide sequence that inhibits virus infection of a cell comprising the steps of:

(a) contacting a cell susceptible to virus infection with an infectious virus particle in the presence and absence of the chimeric polypeptide sequence of claim 2; and

(b) determining whether the chimeric polypeptide inhibits virus infection of the cell, thereby identifying a chimeric polypeptide sequence that inhibits virus infection.

53. The method of claim 52, wherein the virus is an immunodeficiency virus.

54. The method of claim 53, wherein the immunodeficiency virus is HIV.